Creative Idea Generation Via Passing through an Intermediate Space between the Source and the Target

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ABSTRACT

An important aspect in generating creative ideas is the ability of transition from one concept to another concept whose manipulation in certain ways can yield novel viewpoints. Although, the analogical inference has the ability to generate new ideas through a process of carry-over or adaptation from the source onto the target, the certitude in the format of this process may prohibit the generated ideas from being creative in a real sense. To overcome this problem, a new approach is proposed to generating creative ideas based on a two-fold interpretation of the concepts in the source space. According to this approach, first the concepts in the source are interpreted in terms of some concepts in an intermediate space, and the results are then interpreted in terms of the final concepts in the target space. It is observed that the ideas generated in this way are the results of a process, which does not include any direct monologue from the source and the target. More over, the interpretation process discussed above may principally lead to numerous alternatives both in the intermediate and the target spaces. Such ability in generating various alternatives for the final idea provides a high possibility for yielding creative ideas.

Introduction

Out of the existing approaches to knowledge utilization and inference, analogical inference has in particular the ability to generate new ideas, due to its commitment to a process of carry-over or adaptation from the source space onto the target. It should however be noted that, due to the certitude existing in the format of transferring the knowledge of the source to the target, the ideas generated through conventional analogical reasoning may not be creative in a real sense. More over, a simple analogy based on a direct monologue from the source to the target is workable in the situations where idea generation planned to be achieved for a certain well-defined target. This means that the status of creativeness regarding the generated ideas must depend on the status of broadness in the target definition. In this paper, to overcome the above problem, a new analogical approach is proposed for generating creative ideas based on inclusion of an intermediate space between the source and the target, which calls for an interpretation of the concepts in the source in terms of some new concepts, and reinterpretation of these new concepts to generate the final ideas. These interpretation processes principally lead to numerous alternatives both in the intermediate and the target spaces; a fact that helps ideas be generated in a way not necessarily aligned with narrowly defined targets, and therefore enjoy the claim of creativity.

Some Related Works

An Integrated Analogy Model for Creative Reasoning

Within the framework of this model, creativity is interpreted as the search for some source analogue with which to reinterpret a given target domain. A prime benefit of observing integration in analogy is due to the fact that focusing on an individual stage in it eliminates the influence of interactions between stages. Furthermore, indirect interactions between non-sequential stages may not be identified by the constrained models such as the requirements placed up on retrieval by the validation process. The computational model of creative reasoning proposed in (O'Donoghue 1997) is a three-stage process, where the validation phase is divided in two; the first part validates the structure of the transferred knowledge, and the second half requires domain specific expert reasoning within the target domain using the transferred knowledge. We can see that, the creativity within the framework of this model is a time-consuming process, requiring much iteration through the filtering mechanism outlined in the model. The output of any iteration is some new interpretation of the problem domain, but may prove to be

one with no discernible advantage over previous interpretations. However, such apparently fruitless interpretations may ultimately prove useful by providing the inspiration for a further retrieval episode, which delivers an all-encompassing explanation (O'Donoghue 1997).

Conceptual Integration Network

Within the framework of this network, traditional spaces associated with analogical or metaphoric mapping, the source and the target, combine via some structural mapping to produce another independent blended space that provides the local point for the resultant integration (Fauconnier and Turner 1998). The basic peculiarity of this model is the use of an additional distinct coordinating space, known as generic space. This space contains the low-level conceptual structures that serve to mediate between the contents of the input spaces, thus enabling them to be structurally reconciled. Structural reconciliation involves mapping the conceptual structure of one input space onto another so as to ascertain a coherent alignment of elements from each. For instance, in the example of "love as a great teacher", the generic space provides low-level structures that are relevant to the process of personification, and which serve to mediate between the input space of a psychological concept "love", and a physical concept "teacher".

The Proposed Approach

Basic Idea

To avoid the problems existing with a two-space analogical reasoning, an intermediate space is included, whose function is to generate some extra concepts that can later lead to numerous interpretations in the target space.

According to this approach, first the concepts in the source are interpreted in terms of some concepts in the intermediate space, which are called navigating concepts. To assure the process of structural mapping that is essential to analogical reasoning (Gentner 1983), the structural relations between these concepts are subsequently mapped onto similar relations between these navigating concepts. At the next stage, the navigating concepts are interpreted in terms of appropriate concepts in the target space. We call these, final concepts. At this stage, the structural relations obtained for the navigating concepts are equally transferred to the final concepts to generate the final idea. It is observed that the ideas generated in this way are the results of a process, which does not include any direct monologue from the source to the target. Moreover, the interpretations may principally lead to a variety of alternatives for both navigating and final concepts. Our claim is that this ability in producing various alternatives for the final idea, is a key issue in generating creative ideas.

An Example

To make clear the role of the above framework in generating creative ideas, let go through a typical example, which is frequently used in explaining the power of analogy in producing novel ideas (Holland et al. 1986). The example discusses the feasibility of finding a solution for the problem of removing a malignant tumor through the knowledge encapsulated in a pervious solution, which has been decided by a military commander, to conquer the fortress of the enemy. The solution dictates dispatching of the artillery to the fortress via multiple passages. Predictive analogy has the ability to transfer the knowledge encapsulated in this solution to the target space, via hypothesizing a correspondence between the elements, respectively in the war domain (source space) and the domain of medication (target space), and performing structural mapping between the two domains. The above process however can be done through the proposed approach, making use of an intermediate space to be used as an interface between these domains. Taking this approach into accounts, the key concepts participating in the war solution are first interpreted in terms of some navigating concepts in the intermediate space. In the above example, the concepts of "artillery", "passage" and "fortress" can be interpreted for instance as "force", "path", and "target", respectively. At the next stage, these navigating concepts are interpreted in terms of the key concepts in the target space yielding respectively the concepts of "radiation", "biological route" and "tumor".

Suppose that the relations between the concepts of "force", "fortress" and "path" are "dispatching", "multiple" and "via". Transferring these relations to the concepts obtained in the target space, the following structure is obtained as a solution for removing the tumor: … dispatching radiation to the tumor via multiple biological routes…. The entire process of applying the proposed approach to the aforementioned example is illustrated in figure 1.

What we would like to emphasize on in this paper is that, for a creative idea generation, in contrast with the classical approach to predictive analogy within which there is a fixed monologue from the target to the source via a process of carry over / adaptation, the presence of intermediate space between the source and the target provides a medium for generating multiple interpretations of the concepts in the sources, thus making chance for a variety of new ideas to be brought up.

For instance, the concept "artillery" in the source space can also be interpreted as "protector", based upon the vocabulary of the concepts installed in intermediate space. "Protector" in turn may be interpreted as for instance

"drug", "care", "radiation", "support", etc, in the target space. It is worth noticing that a major contrast between the proposed approach and the classical approach to predictive analogy is the absence of the purpose concerning the target in the former. In fact, it is due to this fact that the ideas generated in the target space enjoy a higher variation compared to those generated in case of predictive analogy. Let say, if in the case of predictive analogy the ultimate idea is limited to "dispatching radiation to the tumor in the body via multiple biological routes ", using the above approach may lead us to the ultimate ideas such as "dispatching drug to the anomalous region via multiple routes", or "dispatching medical help for a disastrous situation via multiple channels" and so on. It is thus noticed that the way the concepts in the source are interpreted into some navigating concepts in the intermediate space, and also the way these navigating concepts are interpreted into some concepts in the target

The remaining concern is to observe how these interpretations are to take place. Here, a simple dictionary can be used to determine what alternatives of navigating concepts can be used for the concepts in the source space. Also, with respect to interpreting the navigating concepts into appropriate concepts in the target space, a simple rule based system can be used to show how the former can be replaced by the later based on some descriptors describing the target domain in general (and not a specific purpose in that domain).

We observe that an aspect of creative idea generation could be to develop purpose specific rules for mapping the navigating concepts onto new concepts in the target space. Providing these rules is an efficient manner is a key factor in the process of generating more creative ideas. Space, play a dominant role in generating ideas creatively.

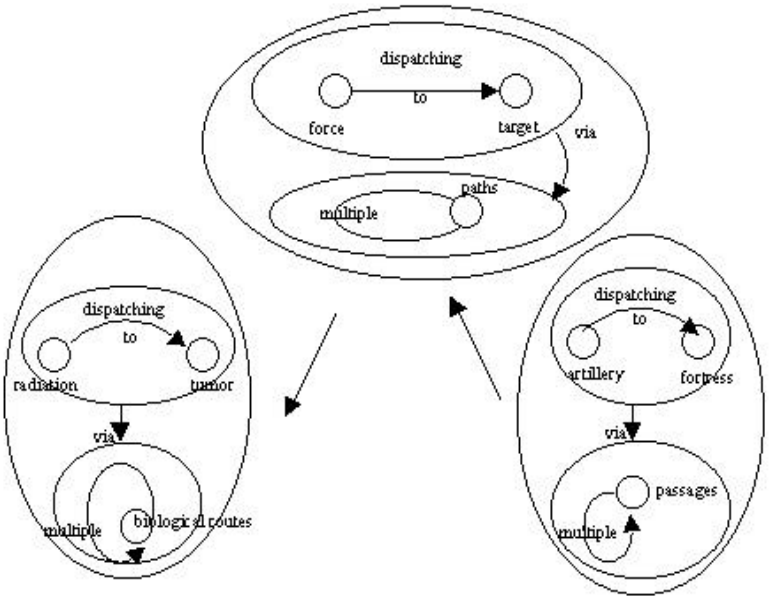

Figure 1: Applying the proposed approach to the example of medication –to-war analogy

Comparing the Proposed Approach With the Related works

Comparing with the integrated model of analogy, no effort is done to search for the appropriate source. It has rather been assumed that the objective of analogical reasoning in our approach is to make a creative use of whatever which has been offered as a source. In fact it is due to the very flexibility in the interpretation processes that the possibility of creative generation of ideas increases.

Also no effort is done to explain anomalies in the target interpretation. As a conclusion, in contrast with the integrated model of analogy whose objective is to select appropriate source(s) via many iterations through the related filtering mechanism, the proposed approach has the ability to compensate for the probable deficiencies in a given source via the interpretation mechanisms, respectively from the given source to the intermediate space, and oppositely from the intermediate space to the target. It is due to these interpretation mechanisms that the total analogical reasoning can exhibit more creative behavior. Comparing the proposed approach with concept

integration and blending, one can claim that the proposed approach can be viewed as a particular version of concept integration wherein the acting generic space includes a number of highly abstract concepts that simultaneously dominate the concepts both in the source and the target space. However, no explicit blending occurs, since the intermediate space in our approach is responsible for one-way transference of the source concepts to the target space, whereas in case of belonging, both source and target are simultaneously fed into the blending mode under coordination of the generic space. Regarding this, we observe that the main role of intermediate space is converting the concepts in the source, while generic space is in charge of coordinating the very interactions, which is essential to blending process. In this sense, it seems that the two interpretational actions -one from the source to the intermediate space, and the other form the intermediate space to the target- can compensate for the deficiency which may come about due to lack of coordination in these interactions.

Concluding Remarks

In this paper a new approach was proposed to analogical reasoning, which includes an intermediate space between the source and the target to assure the numerousness of the final ideas generated in the target space. The very interpretation mechanisms, which are essential to generating the navigating concepts and subsequently the final concepts, can affect the process of creativity.

To preserve the structural mapping in our approach, the structural relations between the concepts are equally transferred from the source to the intermediate space and from the intermediate space to the target space as well. To simplify the reasoning process, structural relations are preferred to be identical in all the three spaces. It is however expected that, applying the interpretation process to the structural relations (making them more flexible) can increase the possibility of generating more creative ideas in the target space. Conclusion is that developing highly potential schemes for the process of interpretation can provide remarkable opportunities for generating highly creative ideas.

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